Subseafloor sediment in South Pacific Gyre one of the least inhabited places on Earth

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(PhysOrg.com) -- An international oceanographic research expedition to the middle of the South Pacific Gyre - a site that is as far from continents as it is possible to go on Earth's surface - found so few organisms beneath the seafloor that it may be the least inhabited sediment ever explored for evidence of life.

Yet since half of the world's ocean is composed of similar gyres, biomass and metabolic activity may be equally low in sediment throughout much of the world.

Those are among the results of a study led by University of Rhode Island oceanographer Steven D'Hondt published in the online edition of the Proceedings of the National Academy of Sciences during the week of June 22. Other URI members of the research team were Marine Research Scientist Robert Pockalny and Oceanography Professors Arthur Spivack and David Smith.

"We wanted to know what life is like in subseafloor sediment where you have the least amount of organic matter produced in the overlying water column," said D'Hondt, a professor at the URI Graduate School of Oceanography. "So we deliberately went where no one ever goes to compare it with sites previously studied."

Gyres are semi-still areas in the middle of the oceans where there is little wind, little current, and very little upwelling of deep water, so the water is clear and contains few nutrients. The South Pacific Gyre is the largest

of Earth's gyres, encompassing an area twice the size of North America. D'Hondt describes its center as "the deadest spot in the ocean."

Because the region is so far from terrestrial sources of sediment and so few organisms live in its water, its sediment accumulates extraordinarily slowly - as few as 8 centimeters per million years.

In 2007, the international team of scientists and students collected nearly 100 cores that reached up to 8 meters below the seafloor of the South Pacific Gyre and measured the number of living cells and the amount of respiration in the sediment. Their cell counts were three to four orders of magnitude lower than have been found at similar depths outside of the gyres, and the rate of respiration was one to three orders of magnitude lower.
Equally surprising was their finding that the subseafloor community is aerobic, unlike all other previously explored sites.

"In most places, oxygen is gone just a few centimeters below the seafloor, but we found that oxygen goes many meters below the seafloor at these sites, and possibly all the way through the sediment to the underlying igneous rock," D'Hondt said.

In addition, D'Hondt said that the burial rate of organic matter was so low in the sediment that the principle food source for the microorganisms living there may be hydrogen released by the radioactive splitting of water due to the natural decay of elements in the sediment.

"As you get deeper, this hydrogen probably becomes a more important food source than buried organic matter," D'Hondt said. "And when you get deep enough, it might be the only food available. The next step in our research is to test if that is the case."

Provided by University of Rhode Island (news : web)